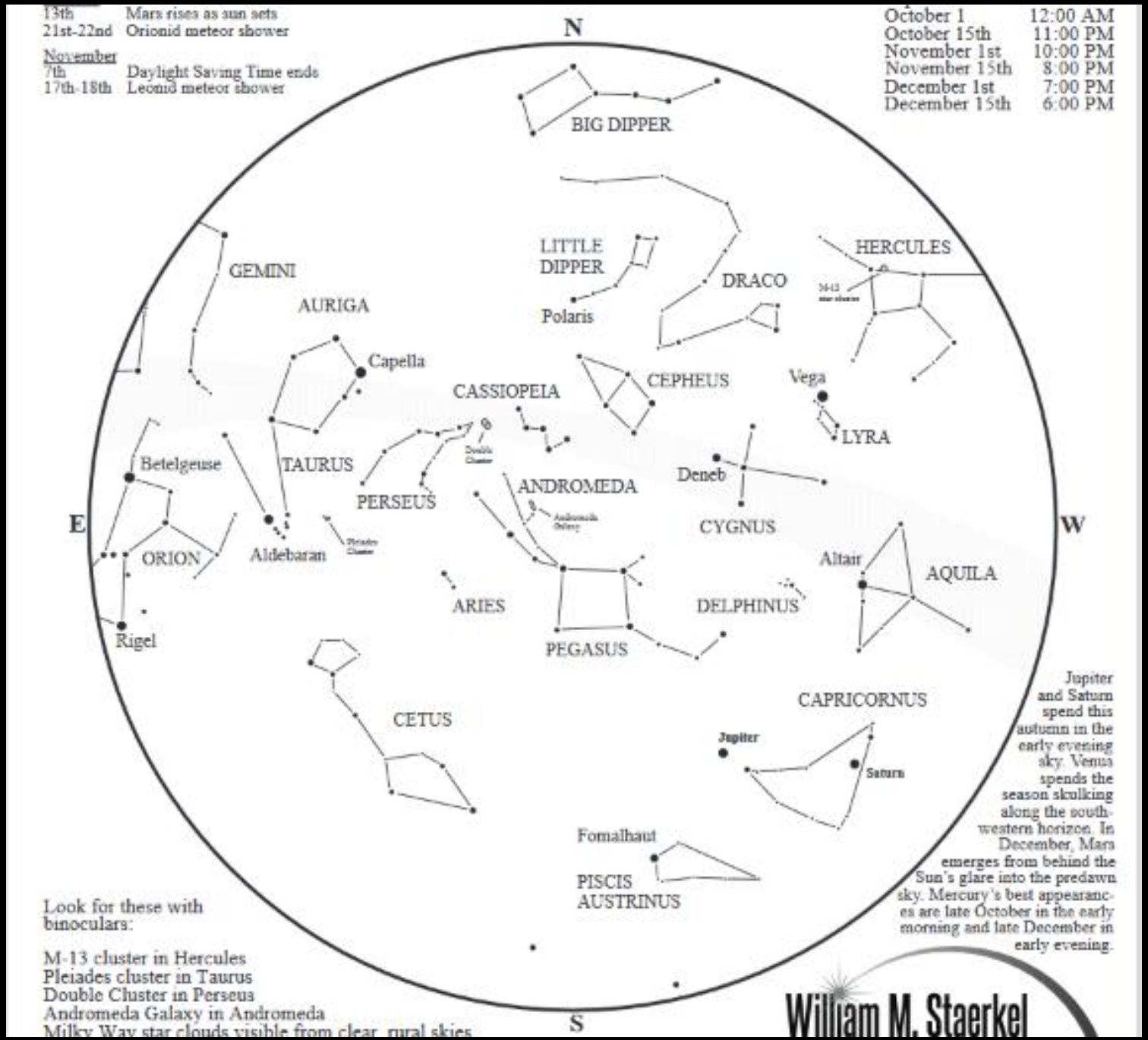
Distance, brightness & finding things in the sky. . .

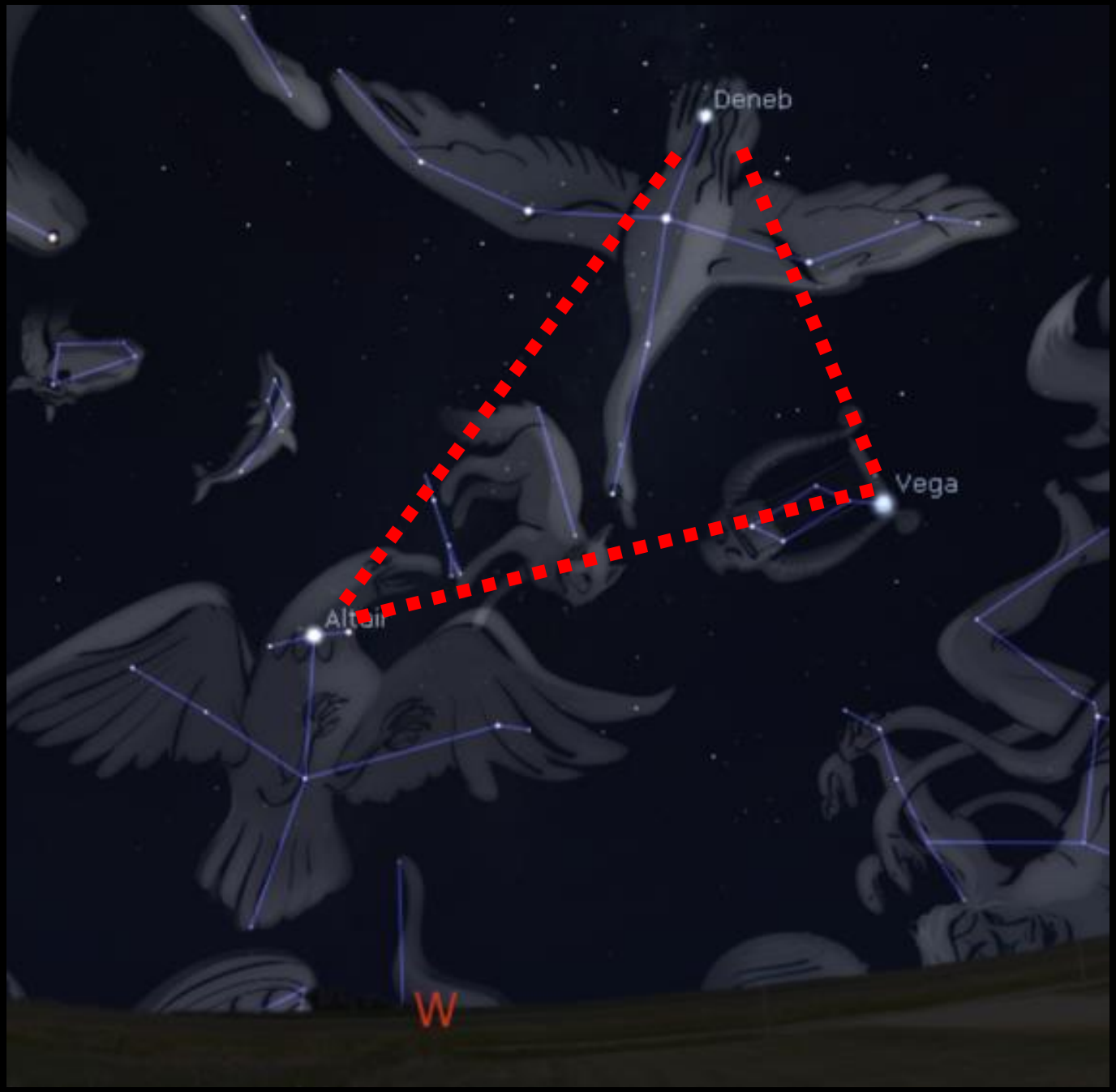
OLLI Week #2

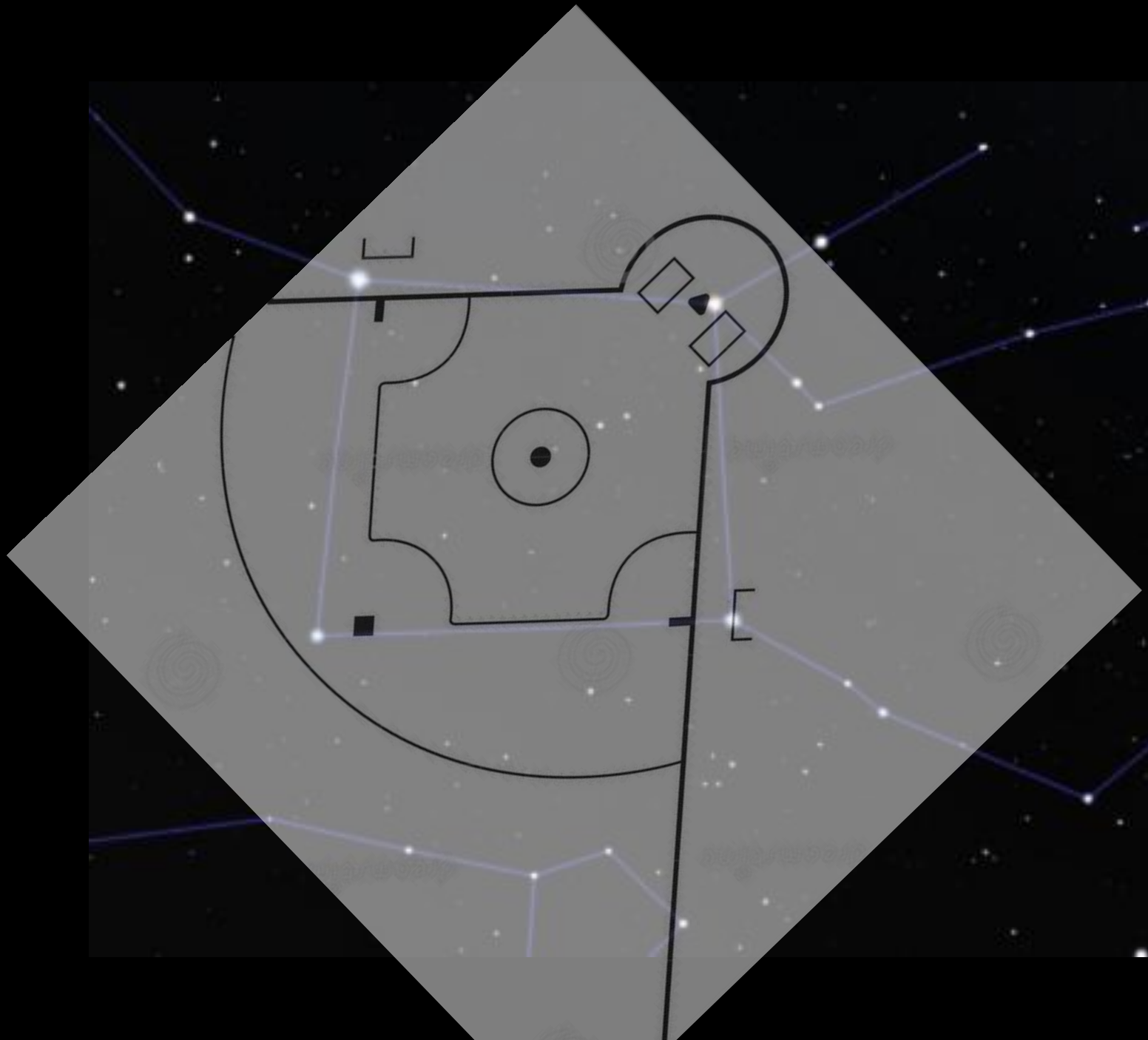
Please submit questions . . . .
dleake@parkland.edu


13th Mars rises as sun sets
21st-22nd Orionid meteor shower
November
7th Daylight Saving Time ends
17th-18th Leonid meteor shower
October 1 12:00 AM
October 15th 11:00 PM
November 1st 10:00 PM
November 15th 8:00 PM
December 1st 7:00 PM
December 15th 6:00 PM
N
E
W
S
BIG DIPPER
LITTLE DIPPER
Polaris
DRACO
HERCULES
GEMINI
AURIGA
Capella
CASSIOPEIA
CEPHEUS
Vega
LYRA
Betelgeuse
TAURUS
PERSEUS
ANDROMEDA
Deneb
CYGNUS
ORION
Aldebaran
Altair
AQUILA
ARIES
DELPHINUS
Rigel
PEGASUS
CETUS
CAPRICORNUS
Jupiter
Saturn
Fomalhaut
PISCIS AUSTRINUS
Look for these with binoculars:
M-13 cluster in Hercules
Pleiades cluster in Taurus
Double Cluster in Perseus
Andromeda Galaxy in Andromeda
Milky Way star clouds visible from clear, rural skies
Jupiter and Saturn spend this autumn in the early evening sky. Venus spends the season skulking along the southwestern horizon. In December, Mars emerges from behind the Sun's glare into the predawn sky. Mercury's best appearances are late October in the early morning and late December in early evening.
William M. Staerkel

Fall

Deneb
Vega
Altair
W


Deneb
Vega
Altair
W



Betelgeuse
Bellatrix
Mintaka
Alnilam
Alnitak
Rigel
Saiph

SOLDIER FIELD
CHICAGO

BAND
FIGHTING ILLINI
101
102
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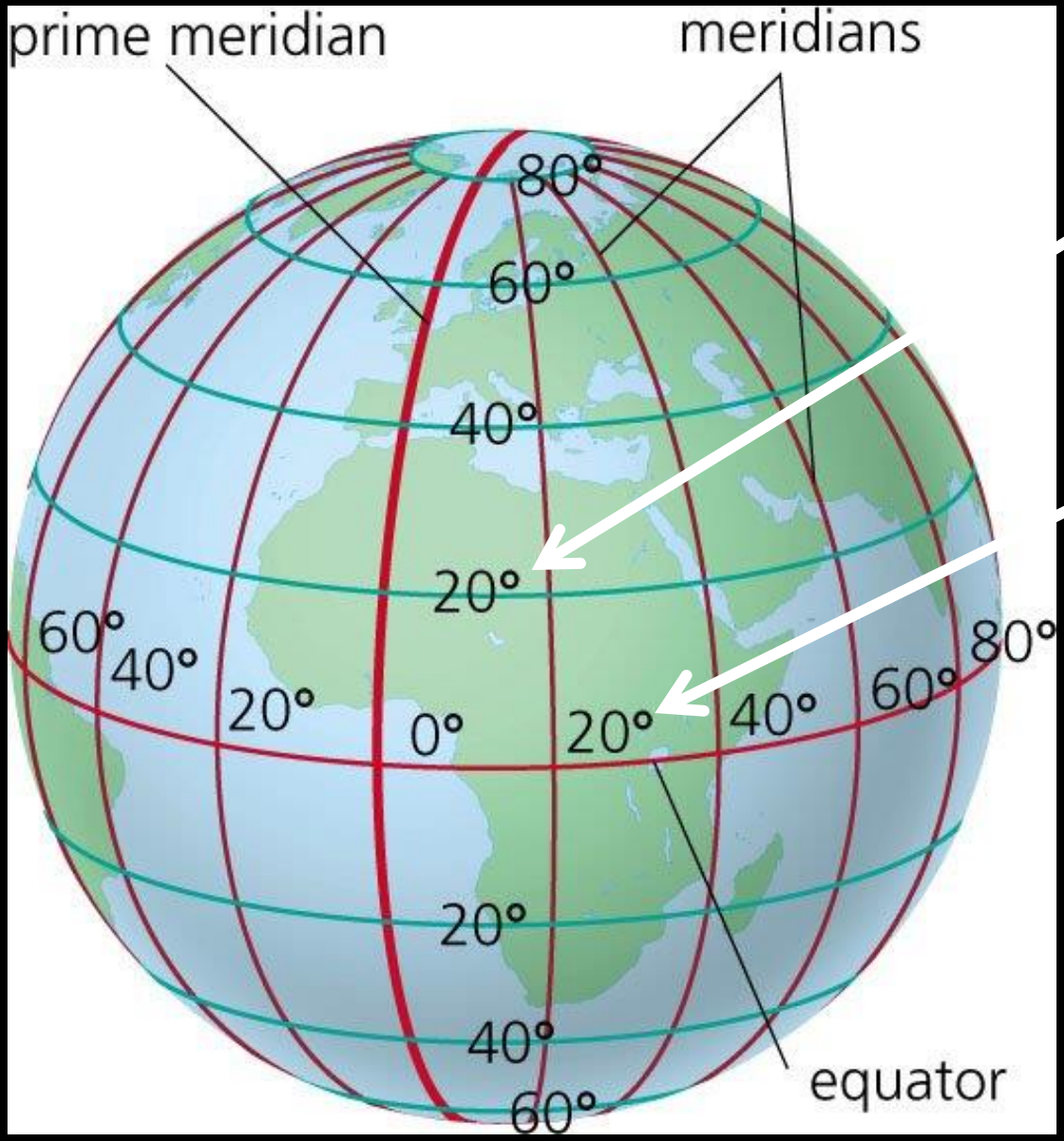
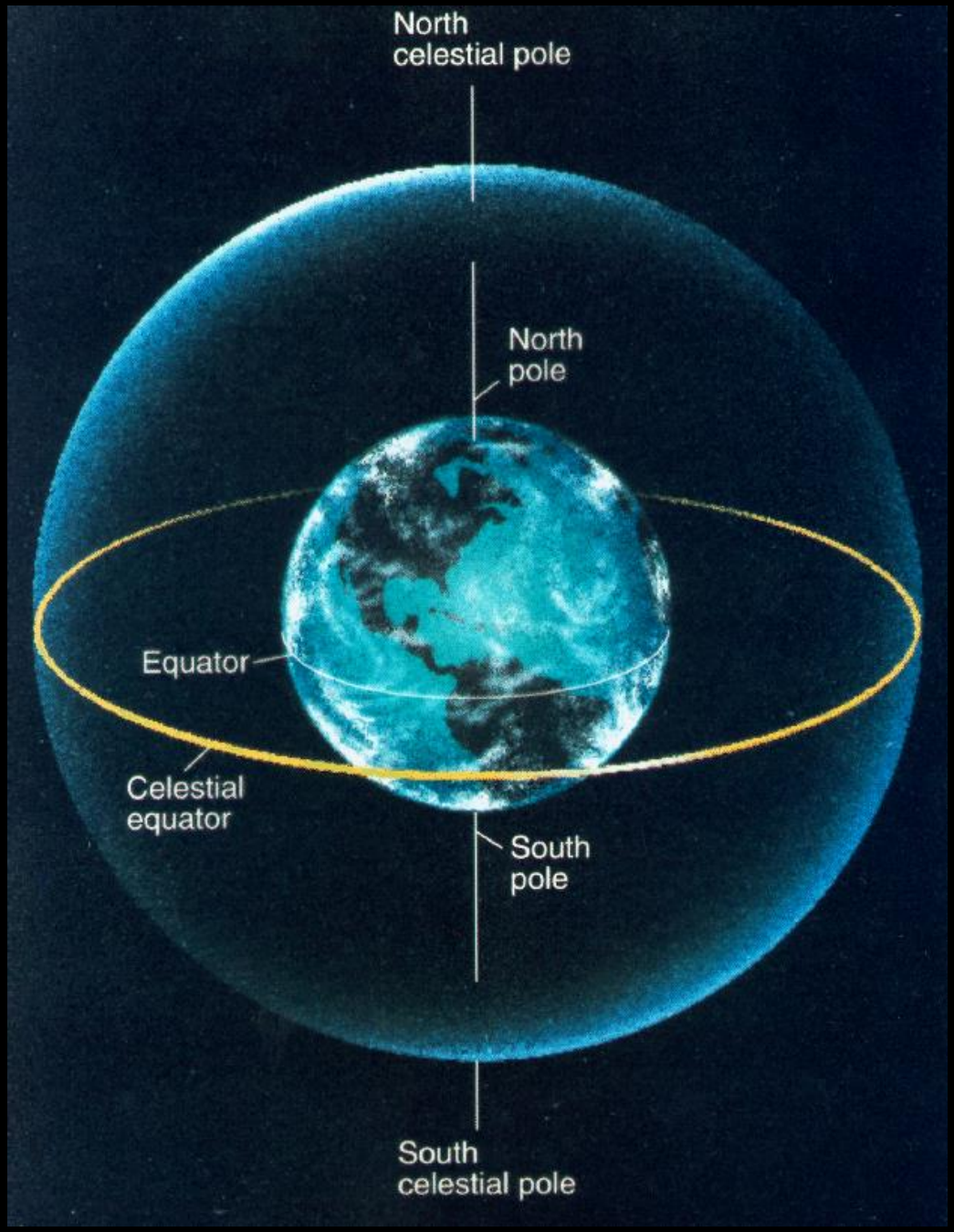


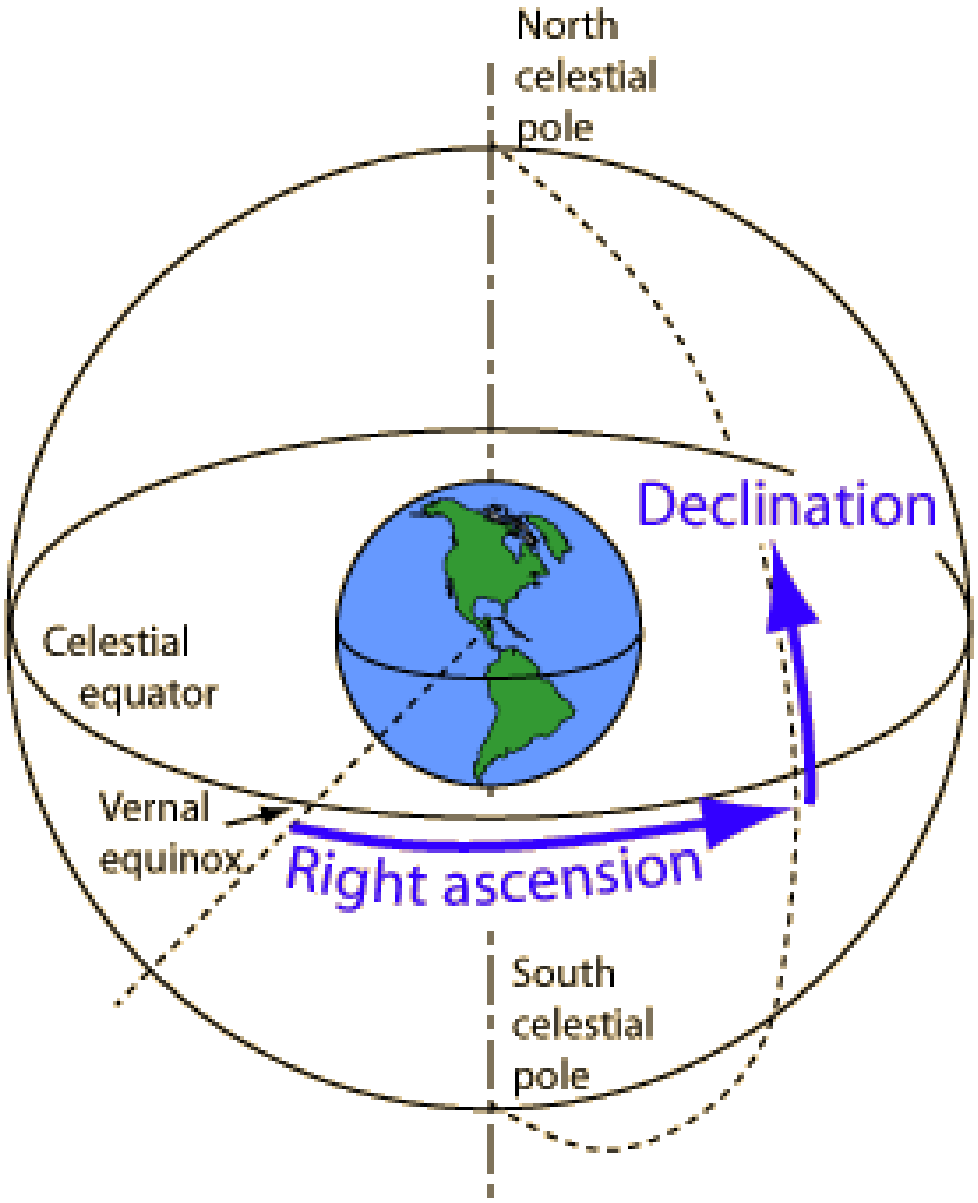
Latitude

Longitude

Champaign
40° North latitude
88° West longitude

Beijing 116° 25' E
Athens 23° 44' E
Tokyo 139° 45' E
Tehran 51° 26' E
Jerusalem 35° 13' E
Cairo 31° 15' E


North
celestial pole
North
pole
Equator
Celestial
equator
South
pole
South
celestial pole



UNITS:

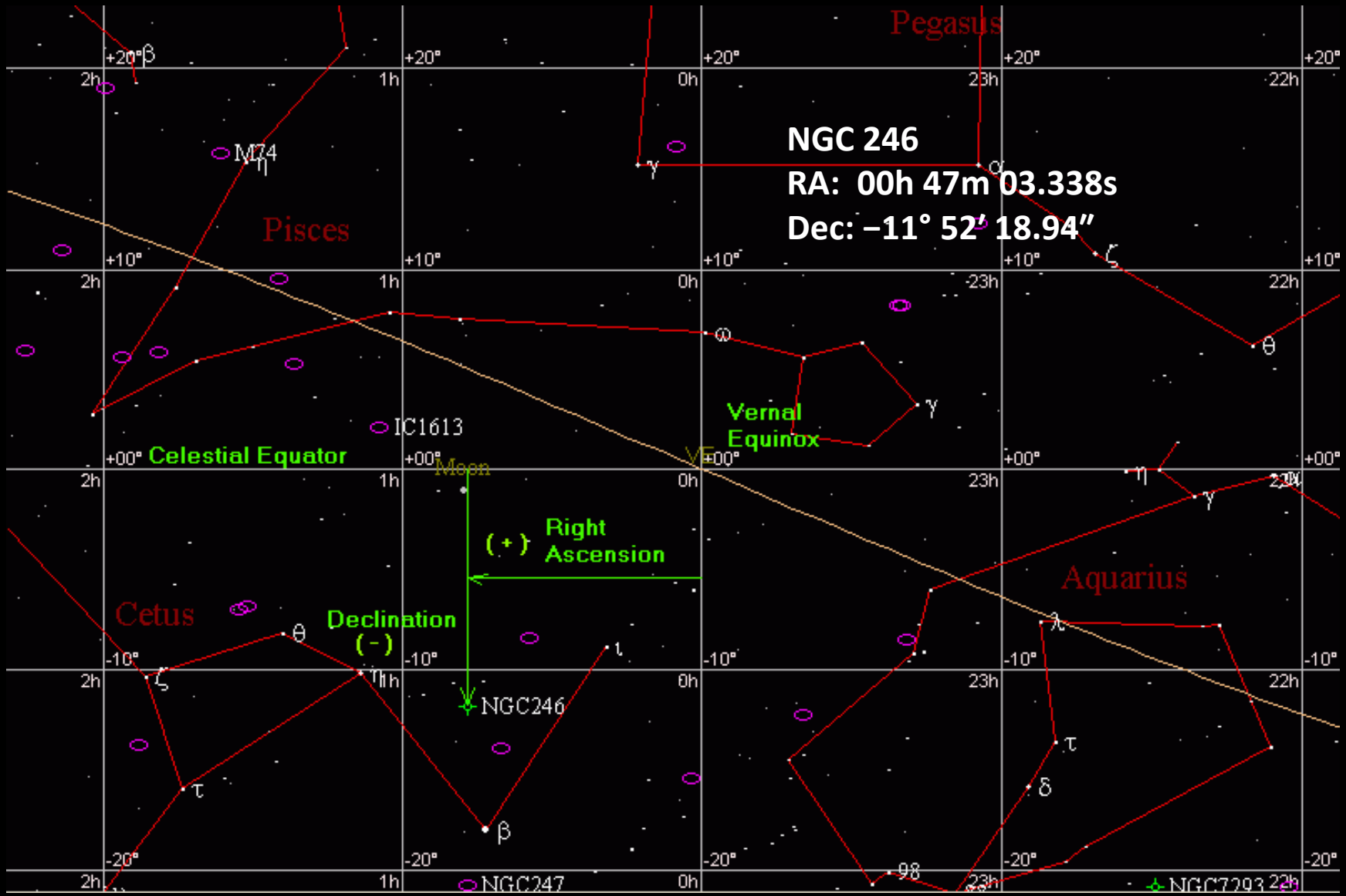
RA: time units
Dec: degrees

CAREFUL:

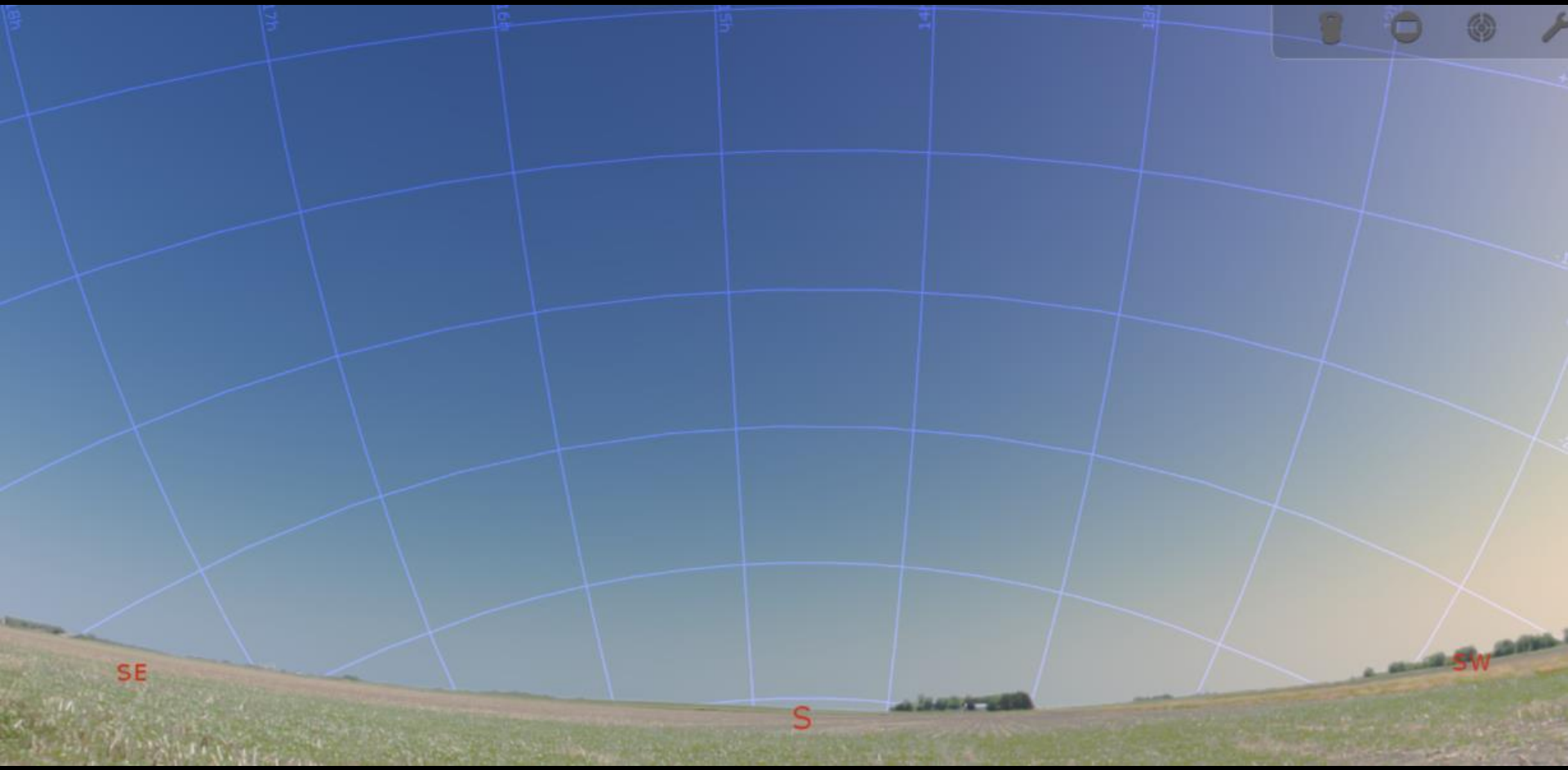
1 hr = 60 min
1 min = 60 sec

1^{o} = 60’
1’ = 60”

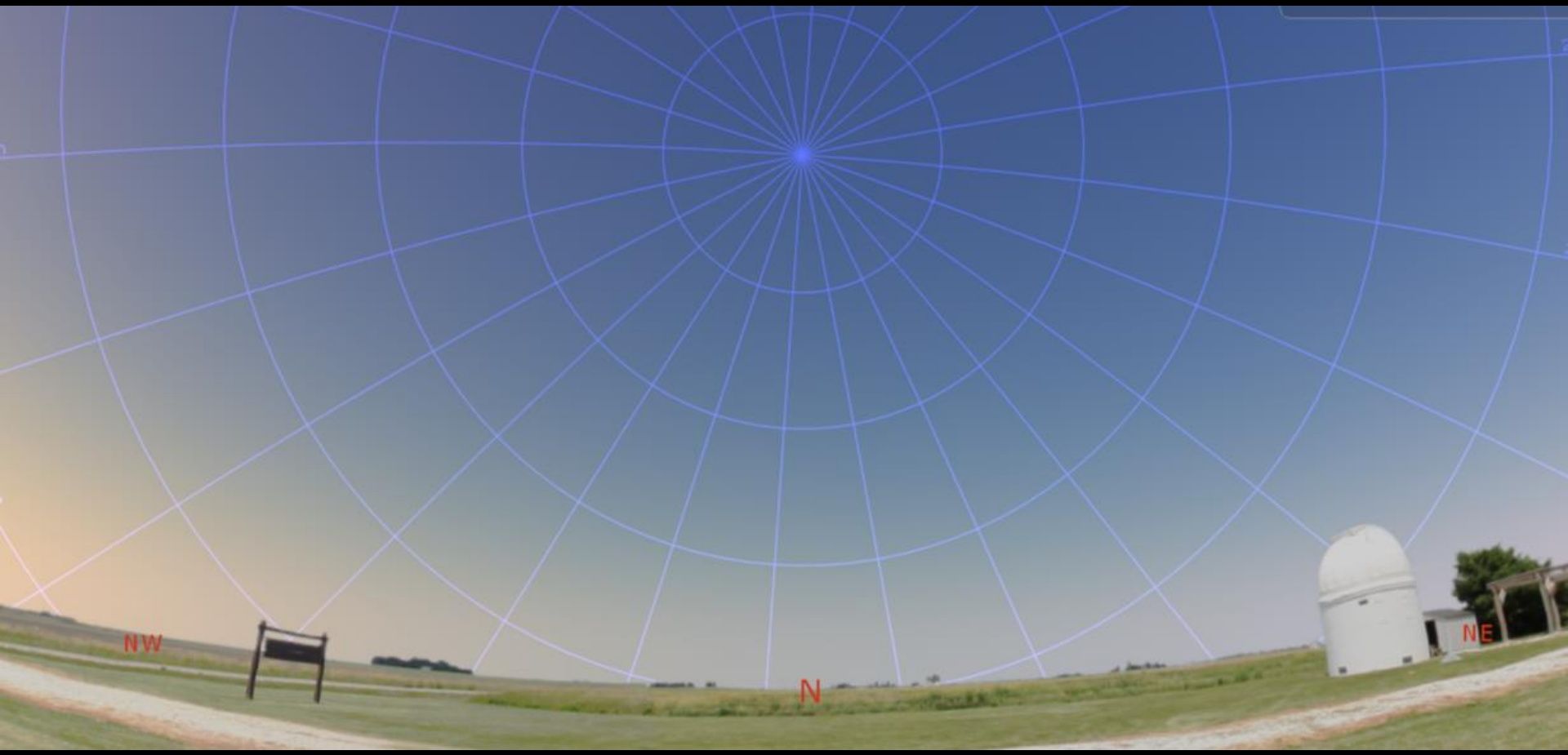
In the sky . . .


Pegasus
Pisces
M74
IC1613
Celestial Equator
Vernal Equinox
Moon
(+) Right Ascension
Declination (-)
Cetus
Aquarius
NGC246
NGC247
NGC7293
NGC 246
RA: 00h 47m 03.338s
Dec: −11° 52′ 18.94″

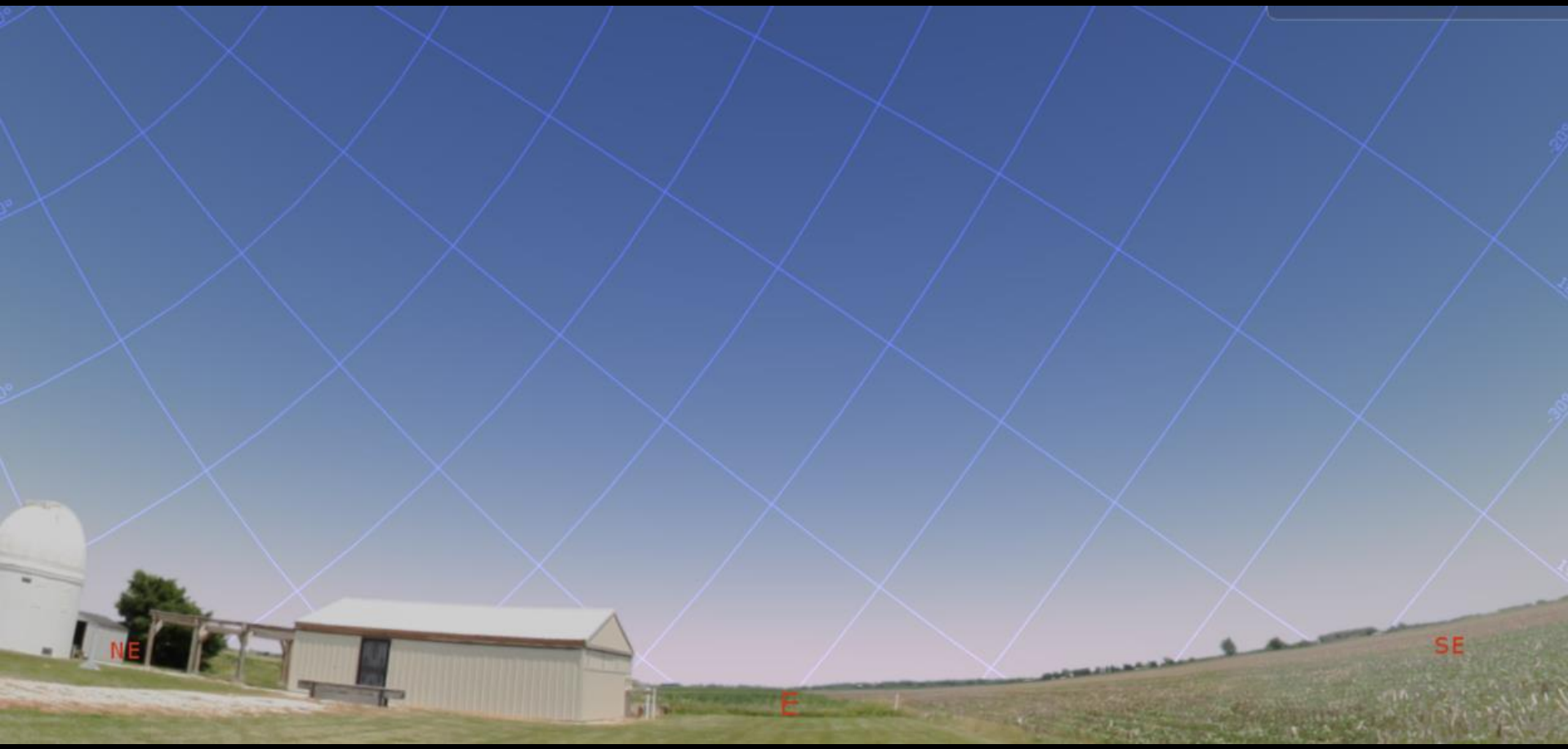
Looking south



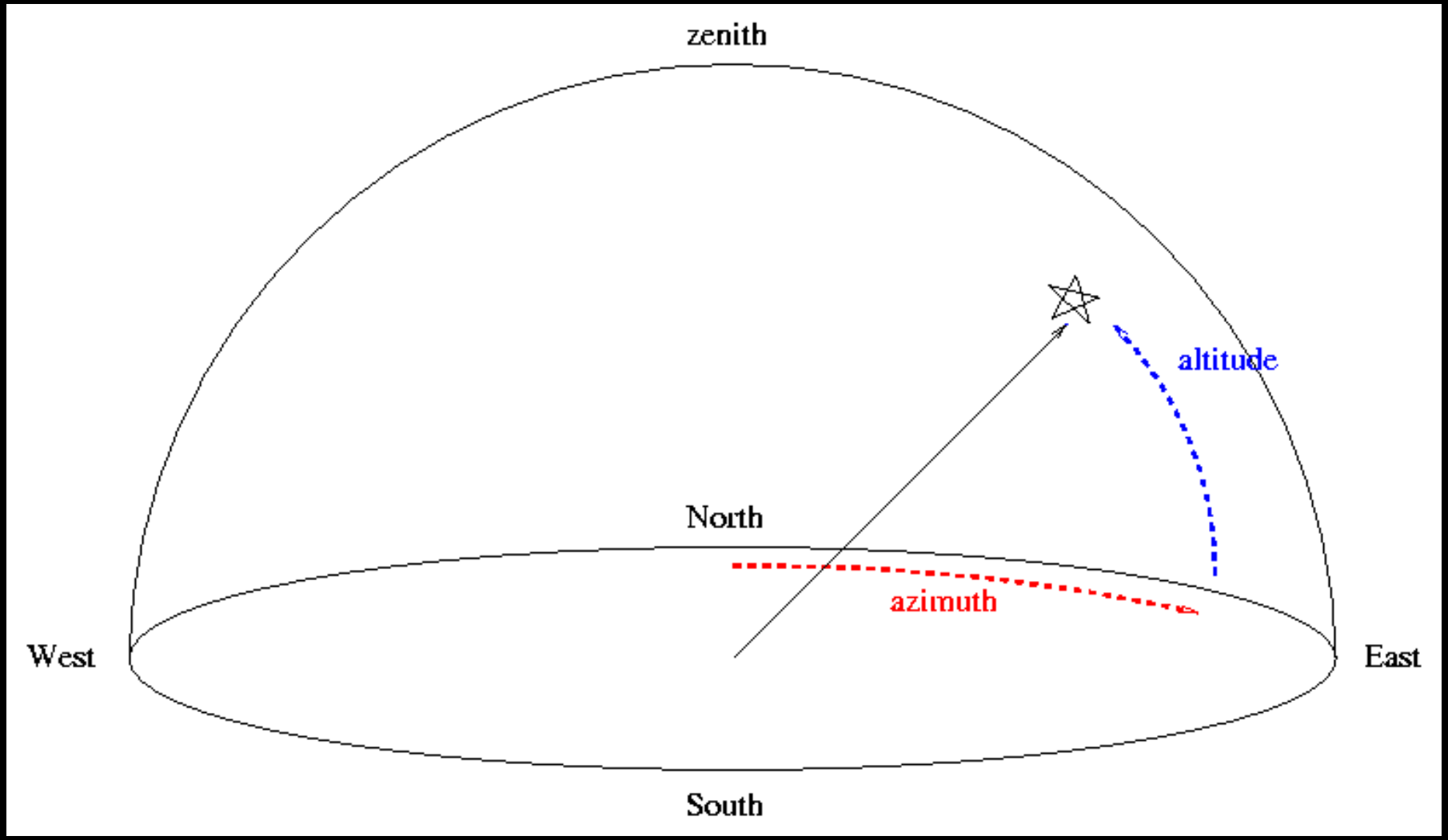
Looking north



Looking east



Or. . . .

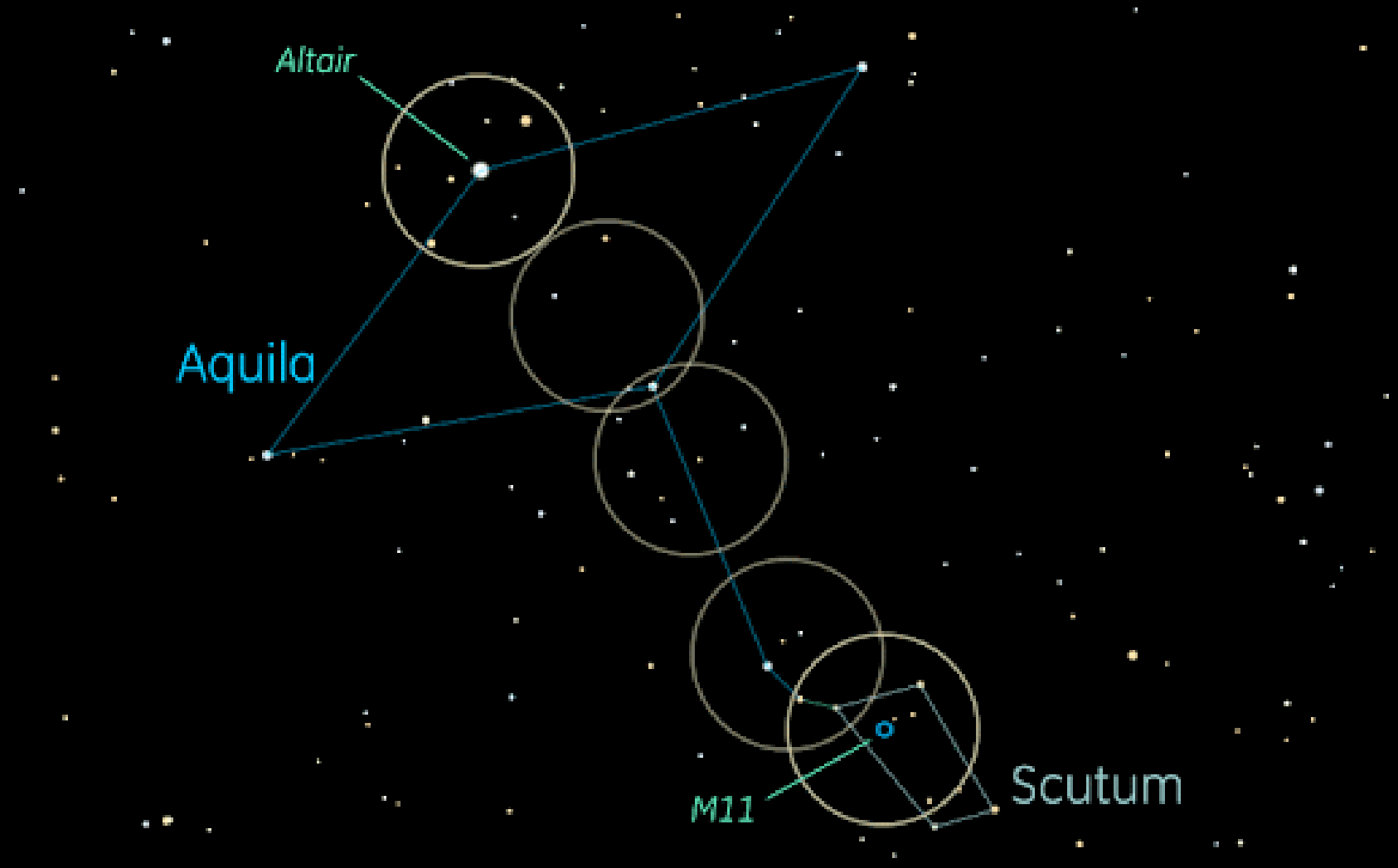


Your fist seen at arm's length is 10 degrees of sky

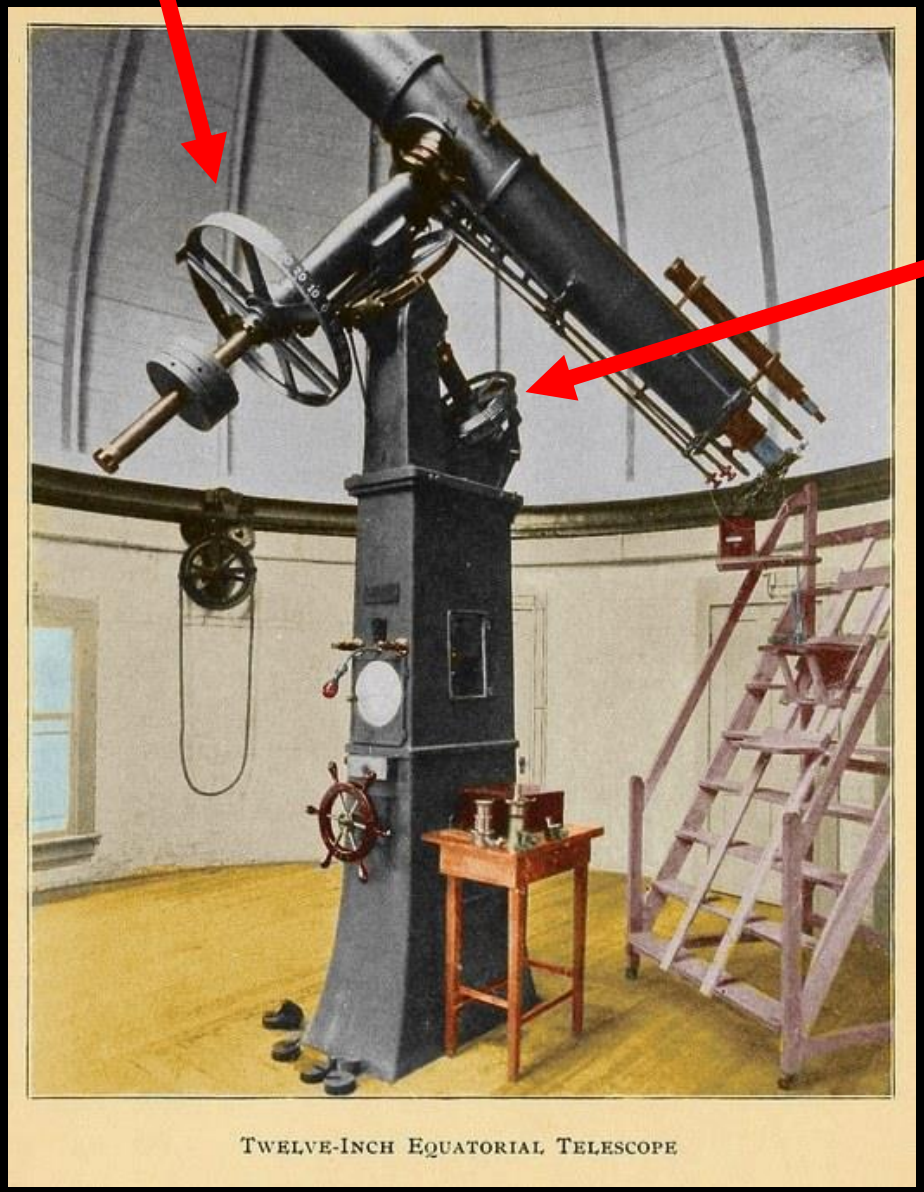
So . . now it's on a chart, now what?

- "Starhopping"
- Setting circles
- Go-to technology

Starhopping . . .

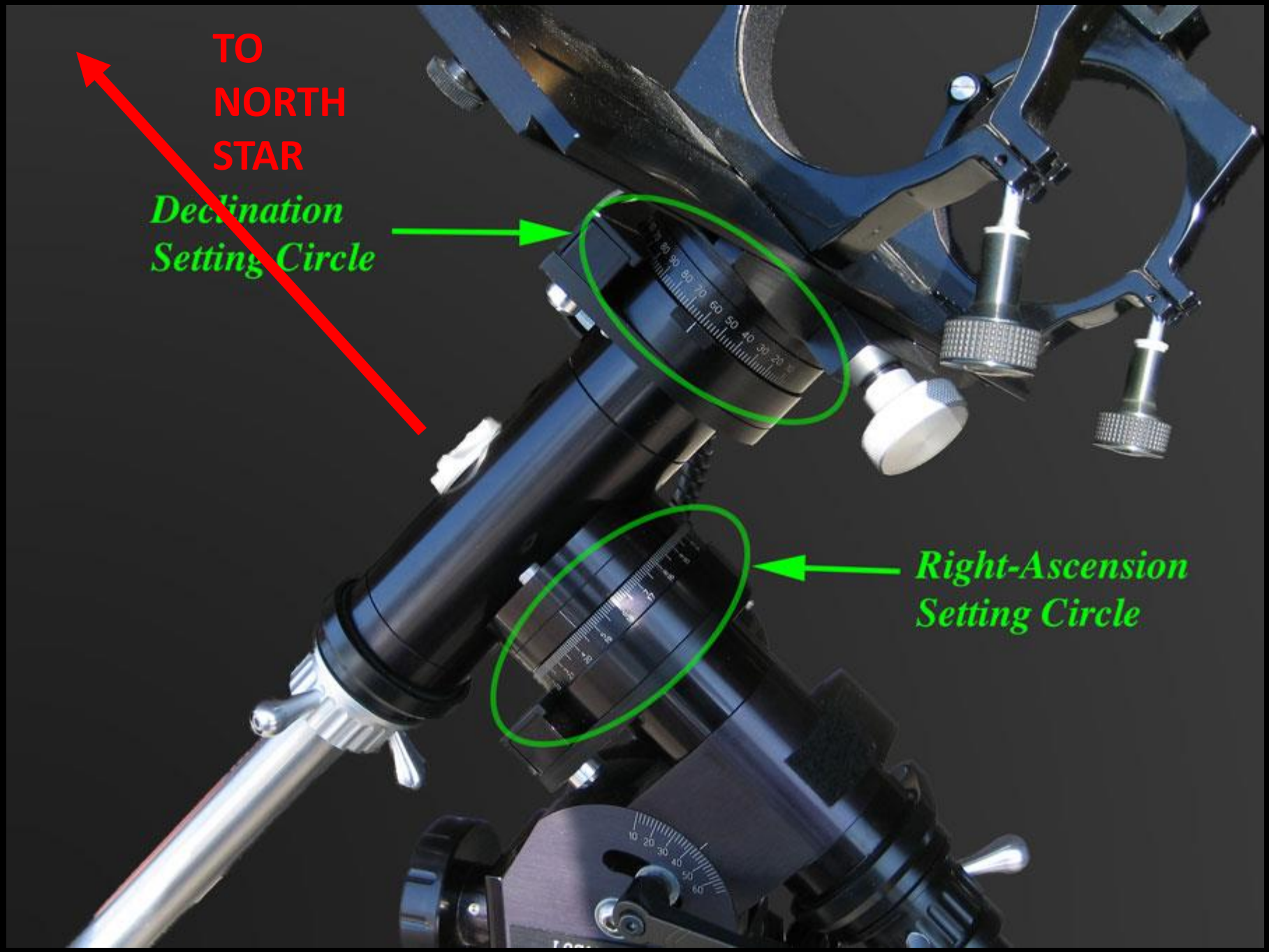


Setting Circles



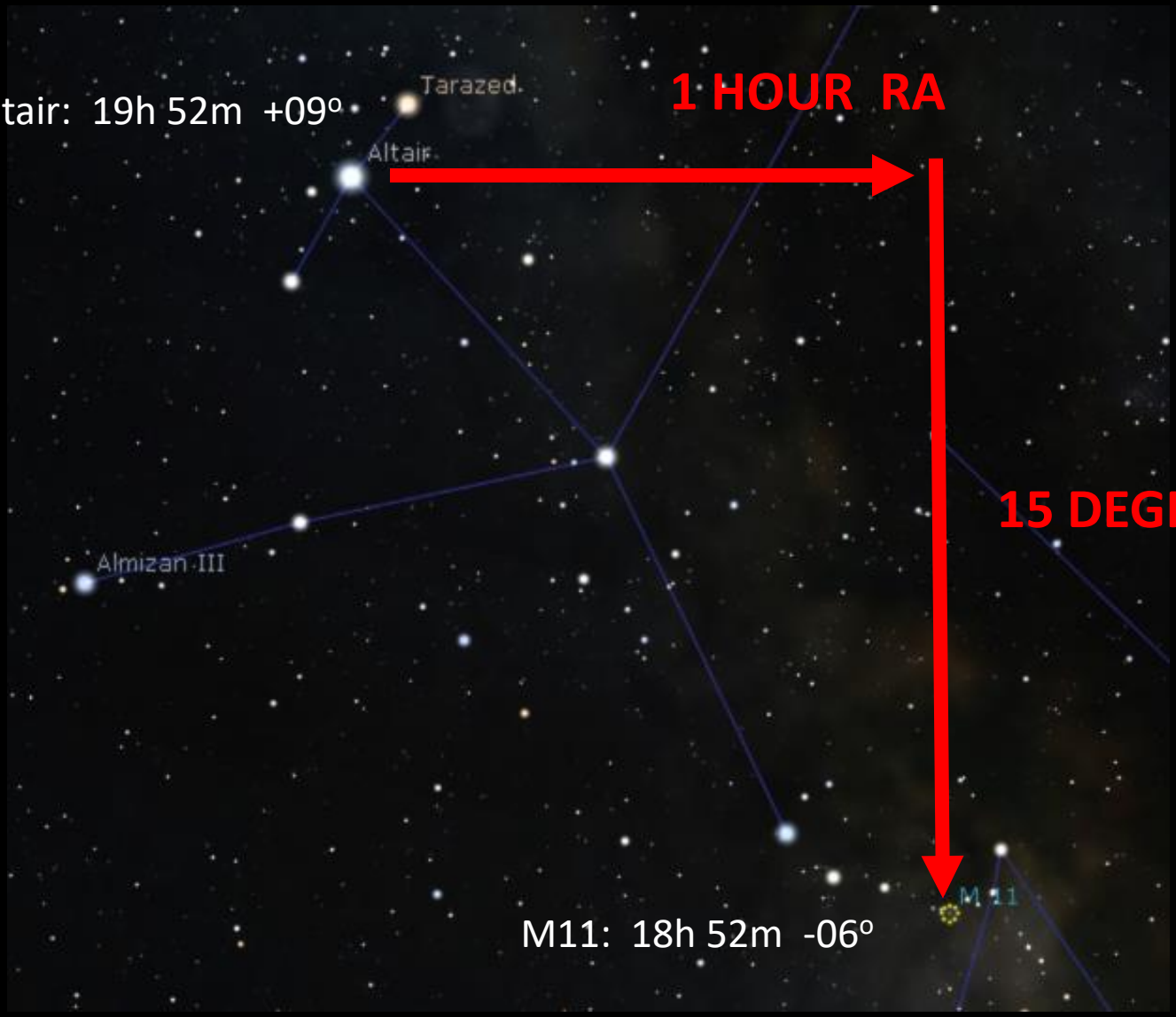
TWELVE-INCH EQUATORIAL TELESCOPE

“Hour Angle” = Sidereal time – Right Ascension of object


TO
NORTH
STAR
Declination
Setting Circle
Right-Ascension
Setting Circle

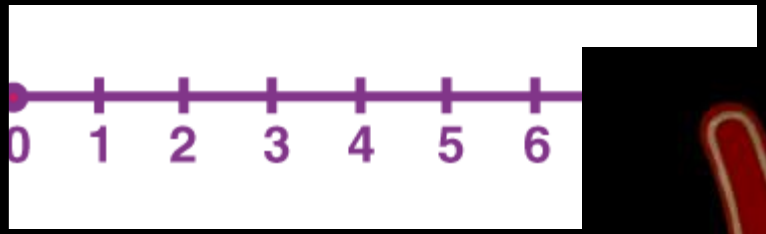
MEADE
LX10

Or. . . Offset from a bright star



“Go-to” & “push-to” telescopes

Star brightnesses – "magnitude"



Fainter

Ptolemy

Star brightnesses – "magnitude"

0 = Vega (standard candle)

1 = 30 1st mag stars

2 = Big Dipper stars

4-5 = unaided eye limit (city)

6 = unaided eye limit (country)

13 = limit with 6" telescope

14 = Pluto

23 = limit of 200" telescope

28 = limit of HST

-26 = Sun

-12 = Full Moon

-4 = Venus (brightest planet)

-1.5 = Sirius (brightest star)

Photoelectric Photometry

For example . . . .

Look up

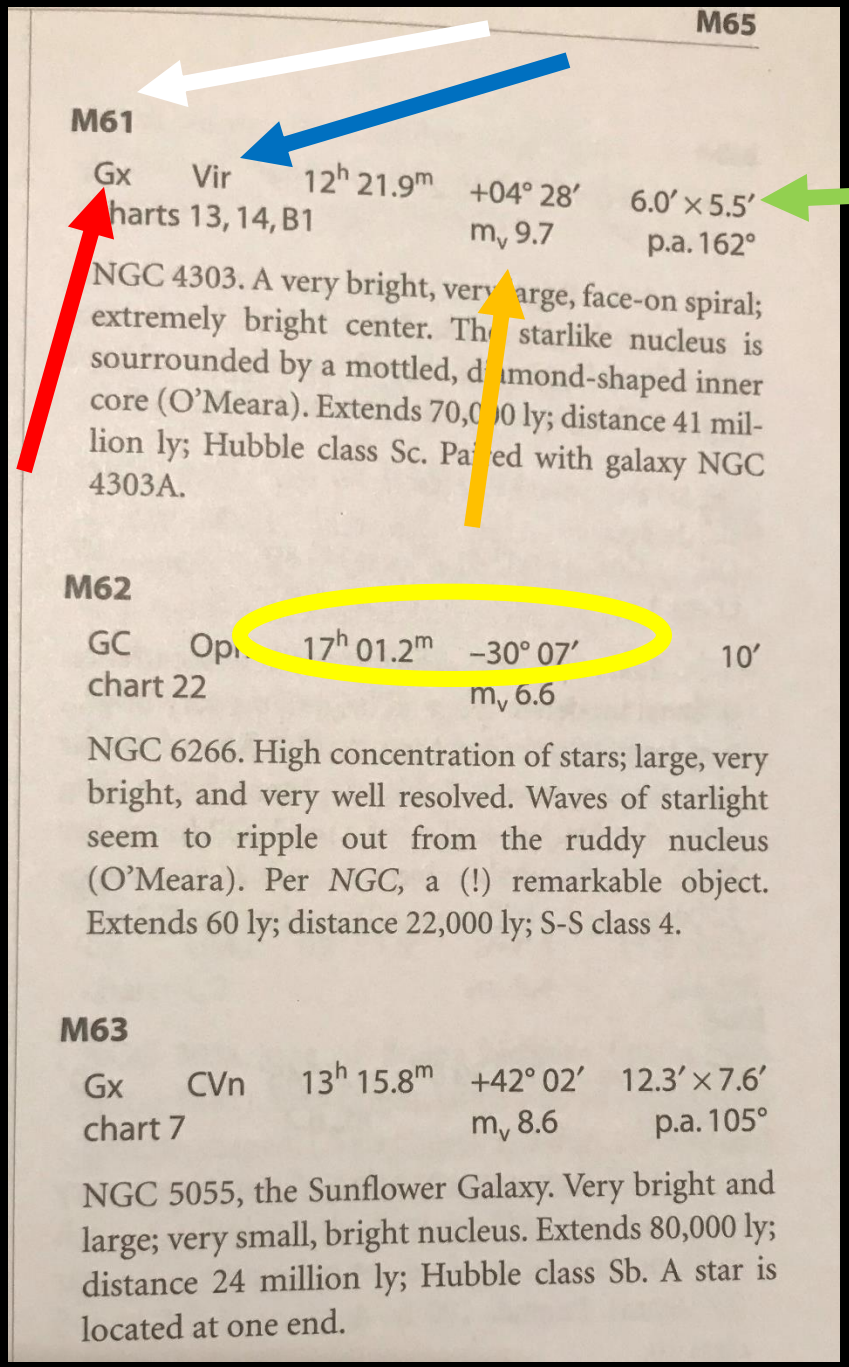
Astronomers have discovered **the largest known comet, and it's coming to a sky near you** in 2031. That gives you plenty of time to track down a good telescope — you'll need it to spot this roaming celestial body.

Comet Bernardinelli-Bernstein, named for the astronomers who found it, is about a thousand times more massive than other comets and between 62 and 124 miles (100 and 200 kilometers) across.

The unusual comet has been making its way toward our sun for millions of years. It likely came from the Oort Cloud, the birthplace of icy, ancient comets and a place more distant from the sun than anything in our solar system. Just imagine what scientists will learn as they observe it for years to come.

Current magnitude: 20.3

Max magnitude: ~17



M61

Gx Vir $12^h\ 21.9^m$ +04° 28′ 6.0′ × 5.5′
charts 13, 14, B1 m_v 9.7 p.a. 162°

NGC 4303. A very bright, very large, face-on spiral; extremely bright center. The starlike nucleus is sourrounded by a mottled, diamond-shaped inner core (O'Meara). Extends 70,000 ly; distance 41 million ly; Hubble class Sc. Paired with galaxy NGC 4303A.

M62

GC Oph $17^h\ 01.2^m$ −30° 07′ 10′
chart 22 m_v 6.6

NGC 6266. High concentration of stars; large, very bright, and very well resolved. Waves of starlight seem to ripple out from the ruddy nucleus (O'Meara). Per *NGC*, a (!) remarkable object. Extends 60 ly; distance 22,000 ly; S-S class 4.

M63

Gx CVn $13^h\ 15.8^m$ +42° 02′ 12.3′ × 7.6′
chart 7 m_v 8.6 p.a. 105°

NGC 5055, the Sunflower Galaxy. Very bright and large; very small, bright nucleus. Extends 80,000 ly; distance 24 million ly; Hubble class Sb. A star is located at one end.

Name
Type
Constellation
Location (RA & Dec)
Apparent Size
Apparent Magnitude

Apparent Magnitude – what it looks like (m)

Absolute Magnitude – how bright it really is (M)

DISTANCE!

Distance units

- *"Astronomical Units"* – good for solar system. Average Earth/Sun distance (93,000,000 miles)

- *"Light Year"* – good for star distances. Distance light travels in a year at 186,000 mps . . .about 6,000,000,000,000 miles!

- *"Kiloparsecs"* – good for galaxy distances. 1 kpc is 3260 light years.

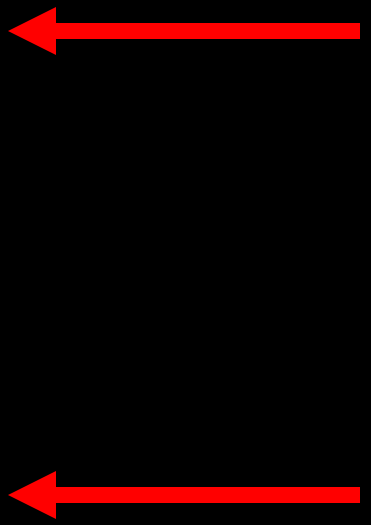
“Astronomical Units”

- Mercury = 0.38
- Venus = 0.72
- Earth = 1.0
- Mars = 1.5
- Jupiter = 5.2
- Saturn = 9.5
- Uranus = 19.2
- Neptune = 30.1

- Pluto = 40
- Arrokoth = 44.6
- Eris = 68

“Brightest” stars?

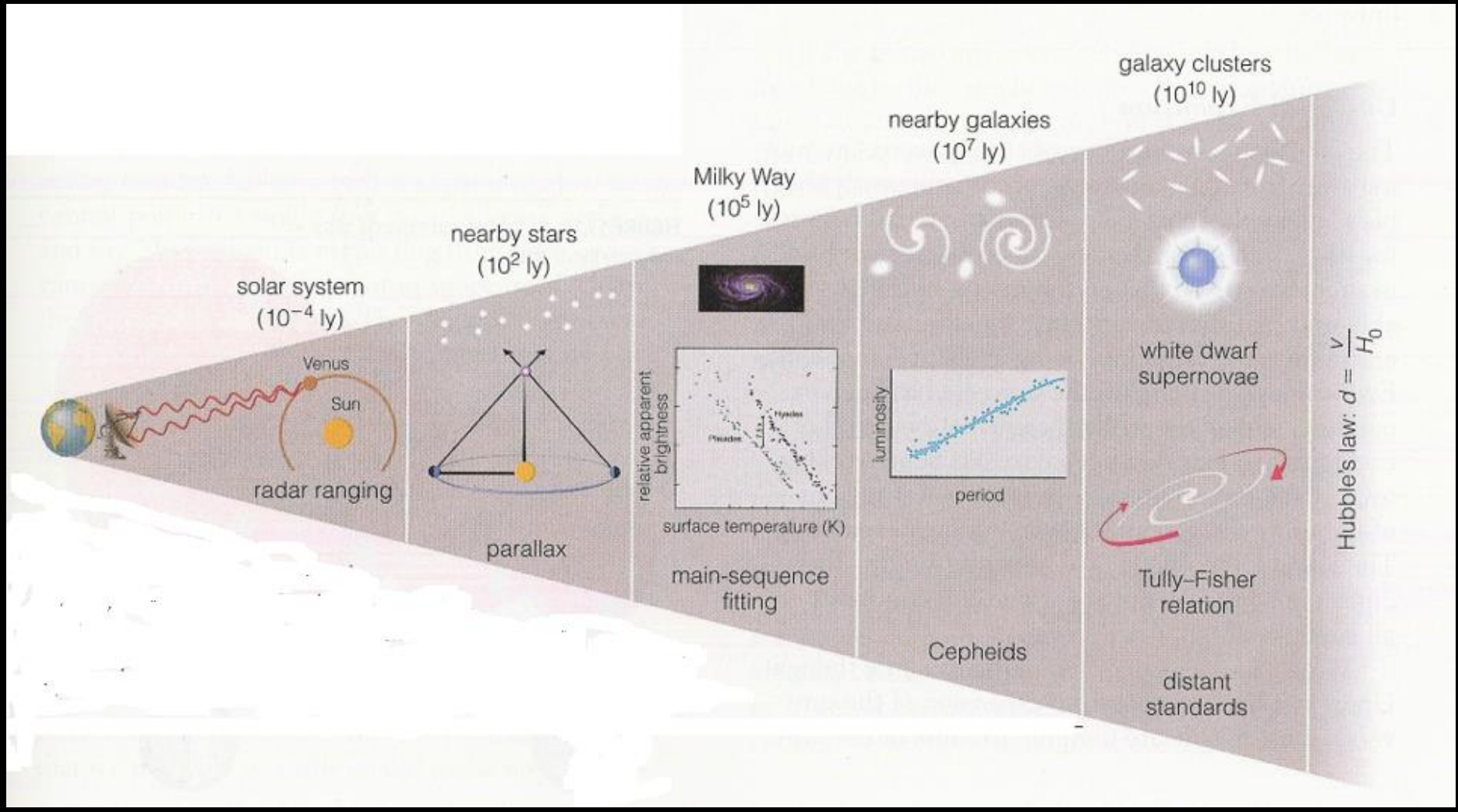
PROPER NAME	DIST (LY)	APP MAG	ABS MAG
Sirius	8.6	-1.46	1.43
Canopus	309	-0.72	-5.60
Rigil Kentaurus A	4.36	-0.01	4.34
Rigil Kentaurus B	4.36	1.33	5.68
Arcturus	37	-0.04	-0.30
Vega	25	0.03	0.60
Capella	43	0.08	-0.51
Rigel	860	0.12	-7.0
Procyon	11.5	0.34	2.61
Achernar	140	0.46	-2.70
Hadar	392	0.61	-4.81
Betelgeuse	570	0.7	-5.5
Altair	16.7	0.77	2.22
Acrux A	325	1.3	-3.9
Acrux B	325	1.8	-3.4
Aldebaran	67	0.85	-0.70
Antares	550	0.96	-5.7



The sky is a "time machine!"

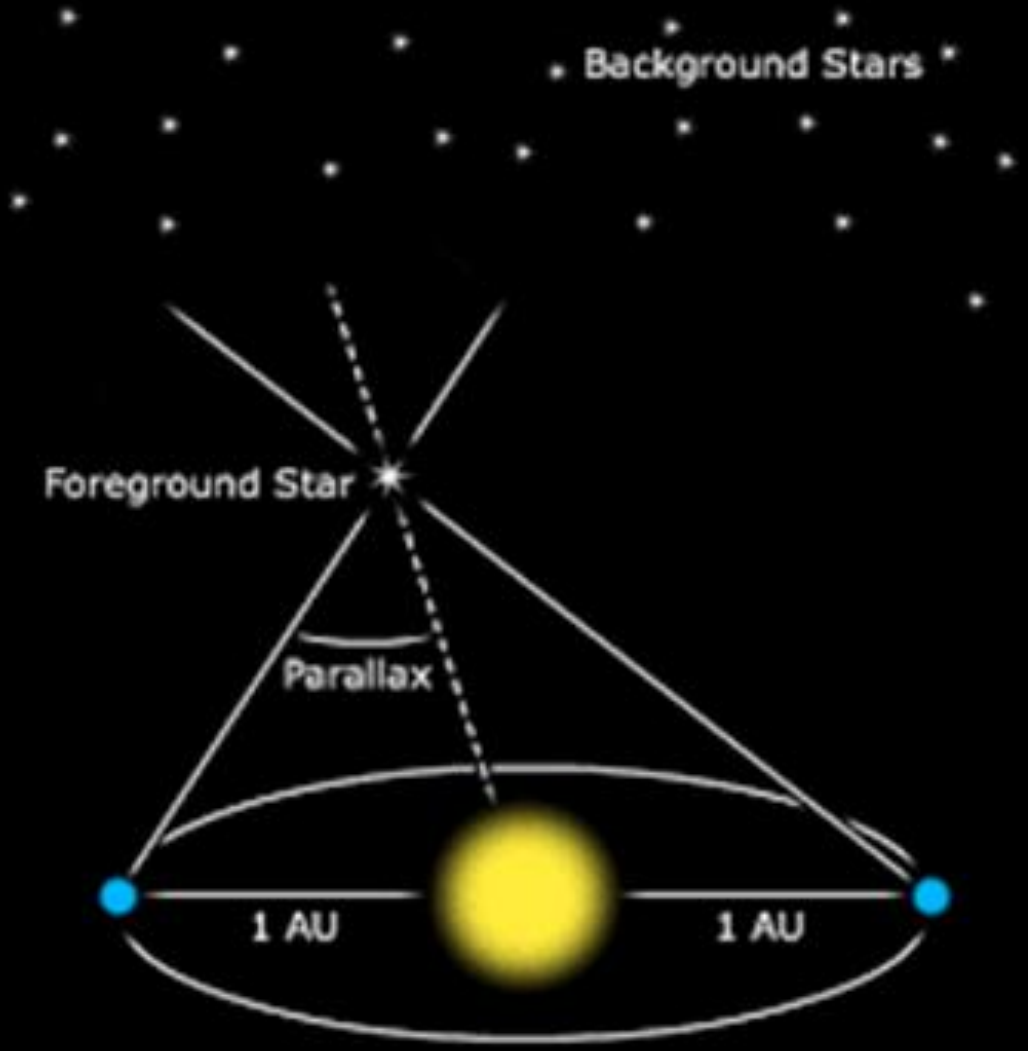
Supernova 1987A

Distance pyramid

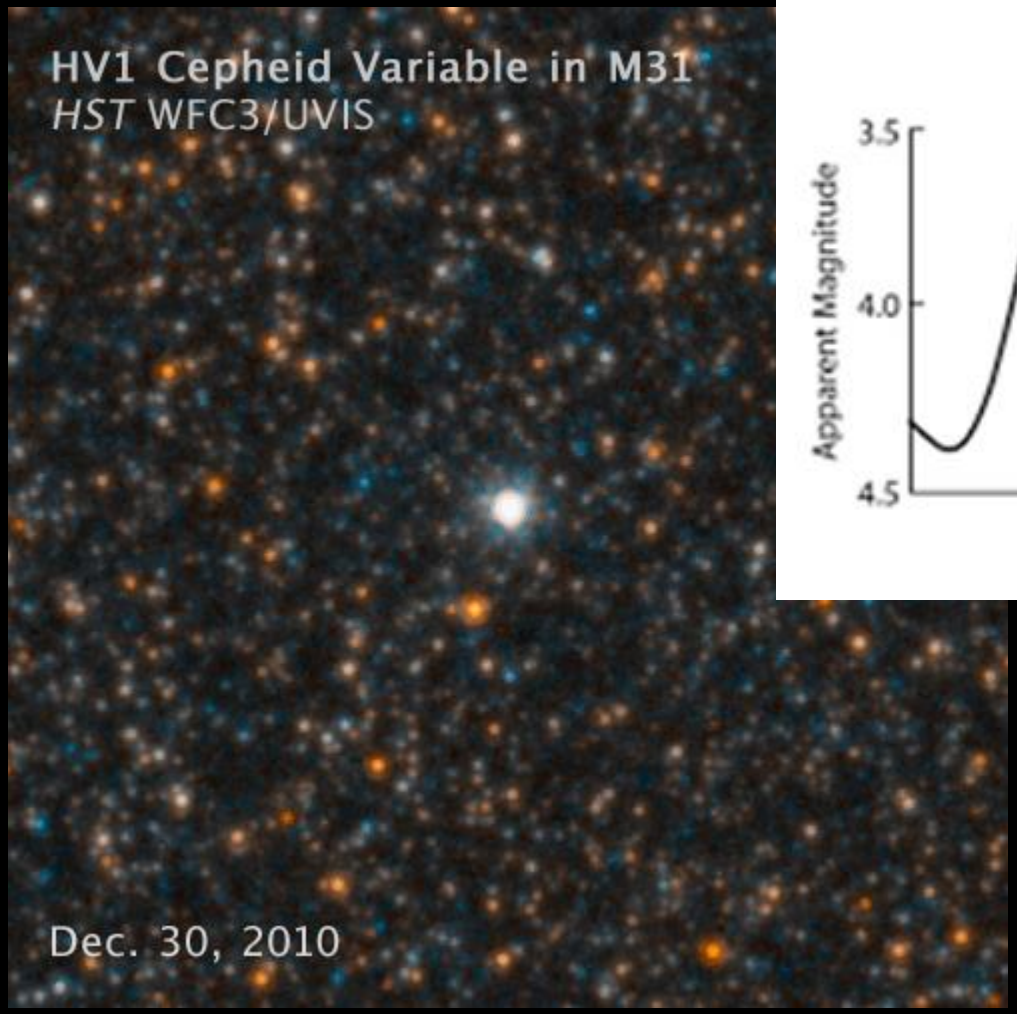


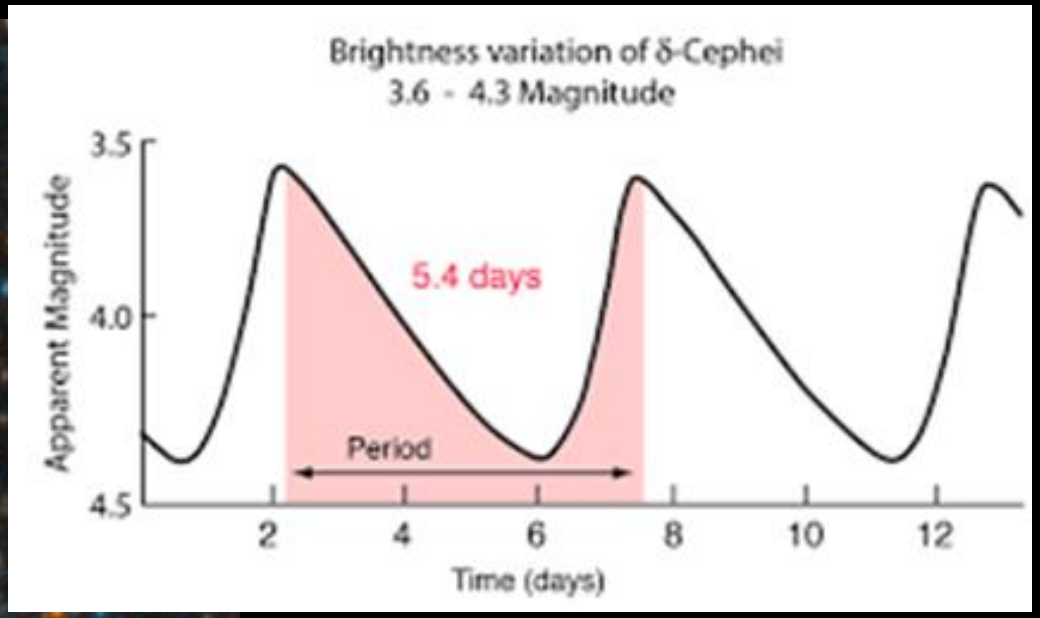
Parallax (with your thumb)

Parallax with the stars

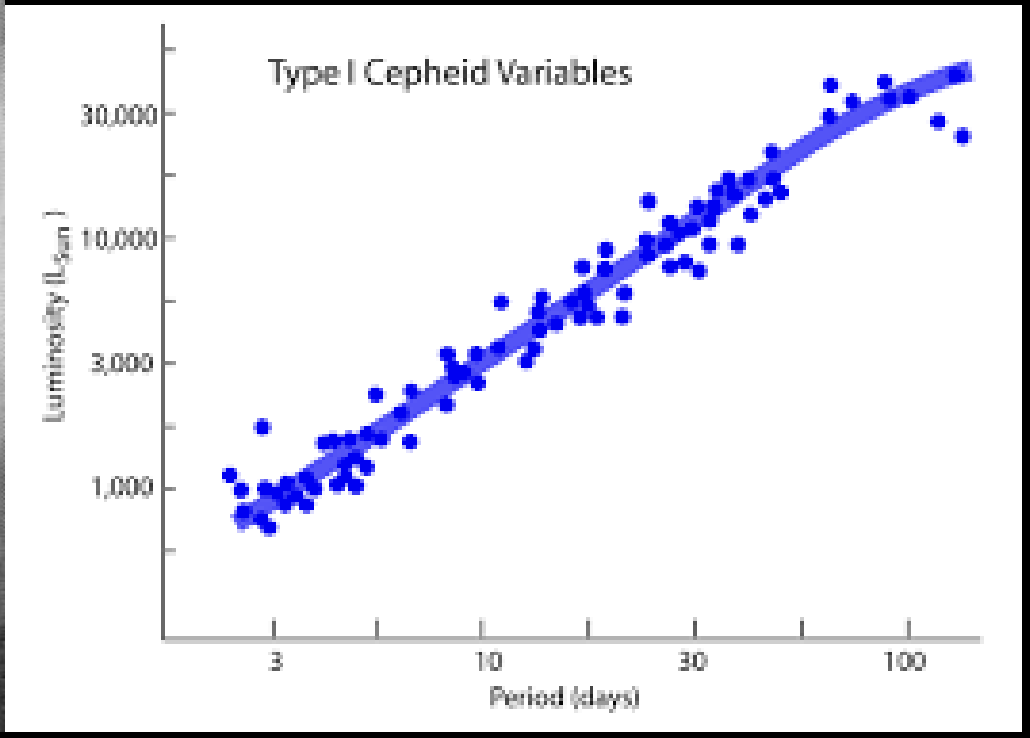


Cepheid Variables





Henrietta Leavitt



Farther out? We make assumptions:

- Radar/planetary motions . . . . . 40 AU
- Parallax . . . . . 300 ly
- Main Sequence Fitting . . . . . .300 kly
- Cepheid Variables . . . . . 23 Mly
- O & B stars . . . . . 32 Mly
- Supernova (M= -19). . . . . 650 Mly
- Brightest galaxy in cluster . . . . . .10 Gly

GN-z11